Examination June, 1978  Ninth Year Mathematics

Elementary Algebra

PART ONE  Answer all questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Write your answers in the spaces provided.

1. Solve for $x$: $8x = 2(x + 15)$

2. Solve for $x$: $\frac{18}{12} = \frac{x}{2}$

3. If 19 is subtracted from three times a certain number, the difference is 110. What is the number?

4. On a map, 1 centimeter equals 50 kilometers. If two cities are 175 kilometers apart, how many centimeters apart are they on the map?

5. Express as a trinomial the product $(x - 5)(x - 3)$.

6. If $C = \frac{5}{9}(F - 32)$, find $C$ when $F = 41$.

7. If $\cos B = .6289$, find angle $B$ to the nearest degree.

8. The lengths of the sides of a triangle are represented by $x + 1$, $2x + 3$, and $3x - 5$. Express the perimeter of the triangle as a binomial in terms of $x$.

9. Solve for $x$: $7x - 3 = 3x - 7$

10. Solve for $x$: $1.2x - .35 = .5x + 5.25$

11. Solve for $a$: $\frac{a}{2} + \frac{a}{6} = 2$
12. Factor completely: \( x^2 - 49 \)

13. Express the product \( \frac{(x + y)^2}{4} \cdot \frac{2}{x + y} \) as a single fraction in simplest form.

14. Factor completely: \( a^2 + 7a + 12 \)

15. Find the positive square root of 57 to the nearest tenth.

16. If 5\% of a number is 30, what is the number?

17. Subtract \( 4m - h \) from \( 4m + h \).

18. Express \( \frac{x^2 + 3x}{2(x + 3)} \) as a fraction in lowest terms.

**Directions (19-30):** Write in the space provided the numeral preceding the expression that best completes each statement or answers each question.

19. What is the remainder when \( 4x^2 - 5x + 7 \) is divided by \( x - 1 \)?
   (1) 6  (2) -2  (3) 8  (4) 16

20. If \( n + 7 \) is an even number, the next larger even number is
   (1) \( n + 5 \)  (2) \( n + 9 \)  (3) \( 10n + 7 \)  (4) \( 2n + 14 \)

21. When \( 12x^4 - 3x^3 + 6x^2 \) is divided by \( 3x^2 \), the quotient is
   (1) \( 9x^2 - 3 \)  (2) \( 5x^2 \)  (3) \( 4x^2 - 3x + 2 \)  (4) \( 4x^2 - x + 2 \)

22. The product of \( 7y^3 \) and \( 4y^5 \) is
   (1) \( 11y^8 \)  (2) \( 11y^{15} \)  (3) \( 28y^8 \)  (4) \( 28y^{15} \)

23. Which ordered pair is the solution of the following system of equations?

\[
\begin{align*}
3x + 2y &= 4 \\
-2x + 2y &= 24
\end{align*}
\]
   (1) \( (2, -1) \)  (2) \( (-4, 8) \)  (3) \( (-4, -8) \)  (4) \( (2, -5) \)
24. Which fraction has the greatest value?
   (1) $\frac{1}{2}$   (2) $\frac{5}{8}$   (3) $\frac{3}{5}$   (4) $\frac{3}{4}$   24____

25. Which is the solution set for $2x > x + 3$?
   (1) $\{x \mid x > 1\}$   (3) $\{x \mid x = 3\}$
   (2) $\{x \mid x > \frac{3}{2}\}$   (4) $\{x \mid x > 3\}$   25____

26. A point on the graph of $x + 3y = 13$ is
   (1) $(4,4)$   (2) $(-2,3)$   (3) $(-5,6)$   (4) $(4,-3)$   26____

27. The solution set of the equation $x^2 - 3x - 10 = 0$ is
   (1) $\{-2,5\}$   (2) $\{-2,-5\}$   (3) $\{2,-5\}$   (4) $\{2,5\}$   27____

28. If $x + ay = m$, then $y$ equals
   (1) $\frac{m-x}{a}$   (2) $\frac{m+x}{a}$   (3) $\frac{m}{a} - x$   (4) $\frac{m}{a} + x$   28____

29. The expression $\sqrt{27} + \sqrt{12}$ is equivalent to
   (1) $\sqrt{39}$   (2) $13\sqrt{3}$   (3) $5\sqrt{6}$   (4) $5\sqrt{3}$   29____

30. Which statement is false?
   (1) The set of integers is closed under subtraction.
   (2) The set of integers is closed under division.
   (3) The set of natural numbers is closed under addition.
   (4) The set of natural numbers is closed under multiplication.   30____

PART TWO   Answer four questions from this part. Show all work unless otherwise directed.

31. Answer both $a$ and $b$.
   $a$ On the same set of coordinate axes, graph the following system of inequalities:
      \[
      \begin{align*}
      y &> x + 4 \\
      x + y &\leq 2
      \end{align*}
      \]  [8]

   $b$ Which of the following points is in the solution set of the graph drawn in answer to $a$?
   (1) $(2,3)$   (2) $(-5,2)$   (3) $(0,6)$   (4) $(-1,0)$   2
32. Answer both a and b.

a  Solve for c: \( \frac{c + 2}{2} - \frac{c - 1}{3} = 4 \) [5]

b  Perform the indicated operation and express the result in simplest form:
\[
\frac{x - 3}{x^2 - 4x} \cdot \frac{x^2 - 16}{x^2 + x - 12}
\] [5]

33. The total attendance at a school play was 850. The tickets for senior citizens were $1.50 each, and the regular tickets were $2.00 each. If the total receipts were $1,650, how many tickets of each kind were sold? [Only an algebraic solution will be accepted.] [5,5]

34. Find three consecutive odd integers such that twice the sum of the second and third is 43 more than three times the first. [Only an algebraic solution will be accepted.] [5,5]

35. The length of a rectangle is 1 centimeter less than twice the width. If the perimeter of the rectangle is 76 centimeters, find the number of centimeters in each dimension of the rectangle. [Only an algebraic solution will be accepted.] [5,5]

36. Answer both a and b.

a  In the accompanying diagram, right triangle ABC has a right angle at C, \( AB = 18 \), and \( BC = 7 \). Find angle B to the nearest degree. [5]
b In the accompanying diagram, right triangle $DEF$ has a right angle at $F$, angle $D = 50^\circ$, and $EF = 8$. Find $DF$ to the nearest integer. [5]

37. The replacement set for $x$ for each of the open sentences below is \{-2, -1, 0, 1, 2\}. On your answer paper write the letters $a$ through $e$ and next to each letter, write the solution set of each open sentence. [Each answer must be a subset of the replacement set.]

\begin{align*}
a & \quad (x - 1)(x + 2) = 0 \\
b & \quad -1 < x \leq 1 \\
c & \quad 5x + 1 < 3x + 1 \\
d & \quad x^2 = 1 \\
e & \quad |x| = -2
\end{align*}